Machine Learning for the Identification of Geographic Hotspots to Deploy HIV Testing for Prevention, Early Case Finding and Targeted Post-Test Services

Digital Platforms to Enhance HIV Testing and Linkage Coverage

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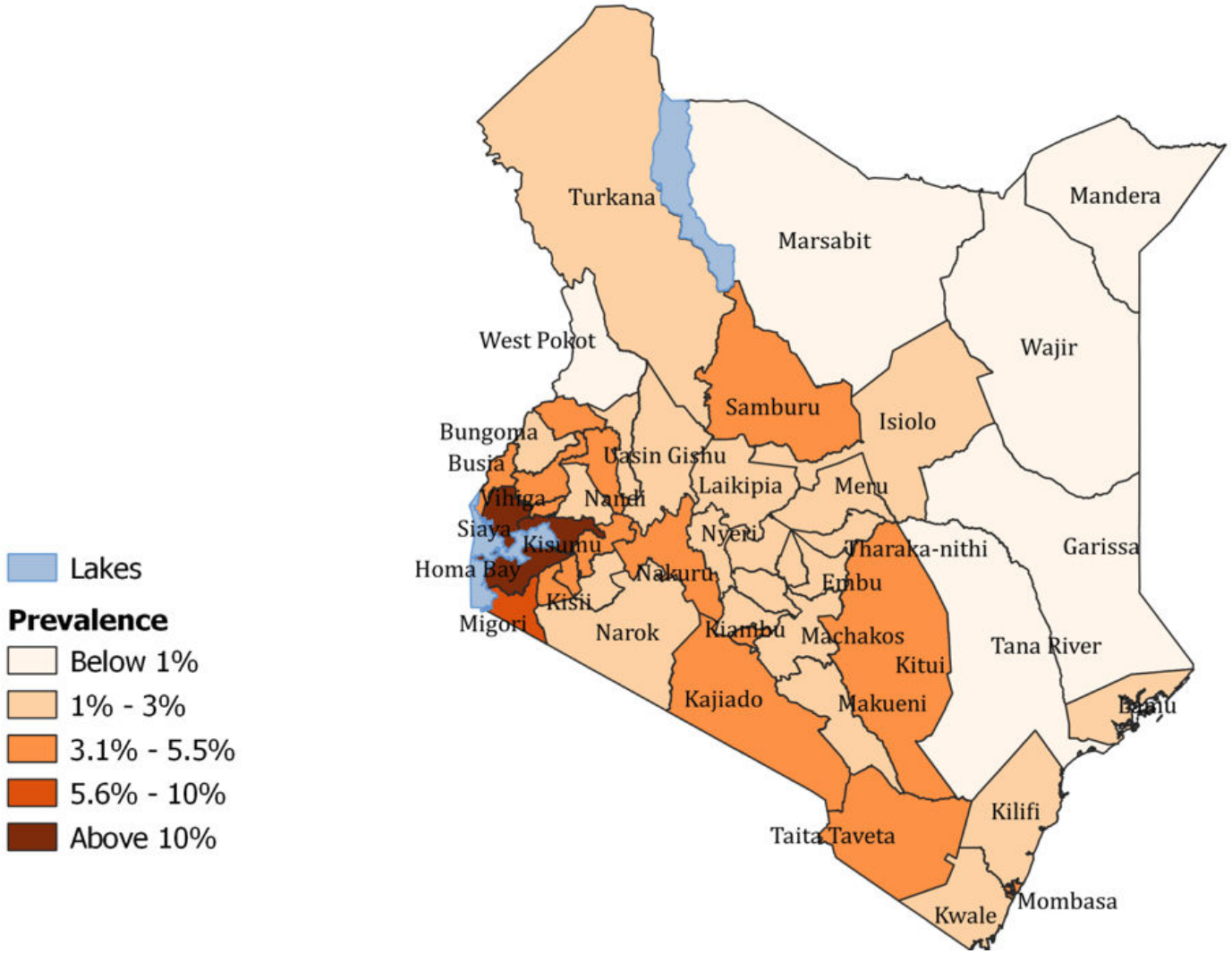
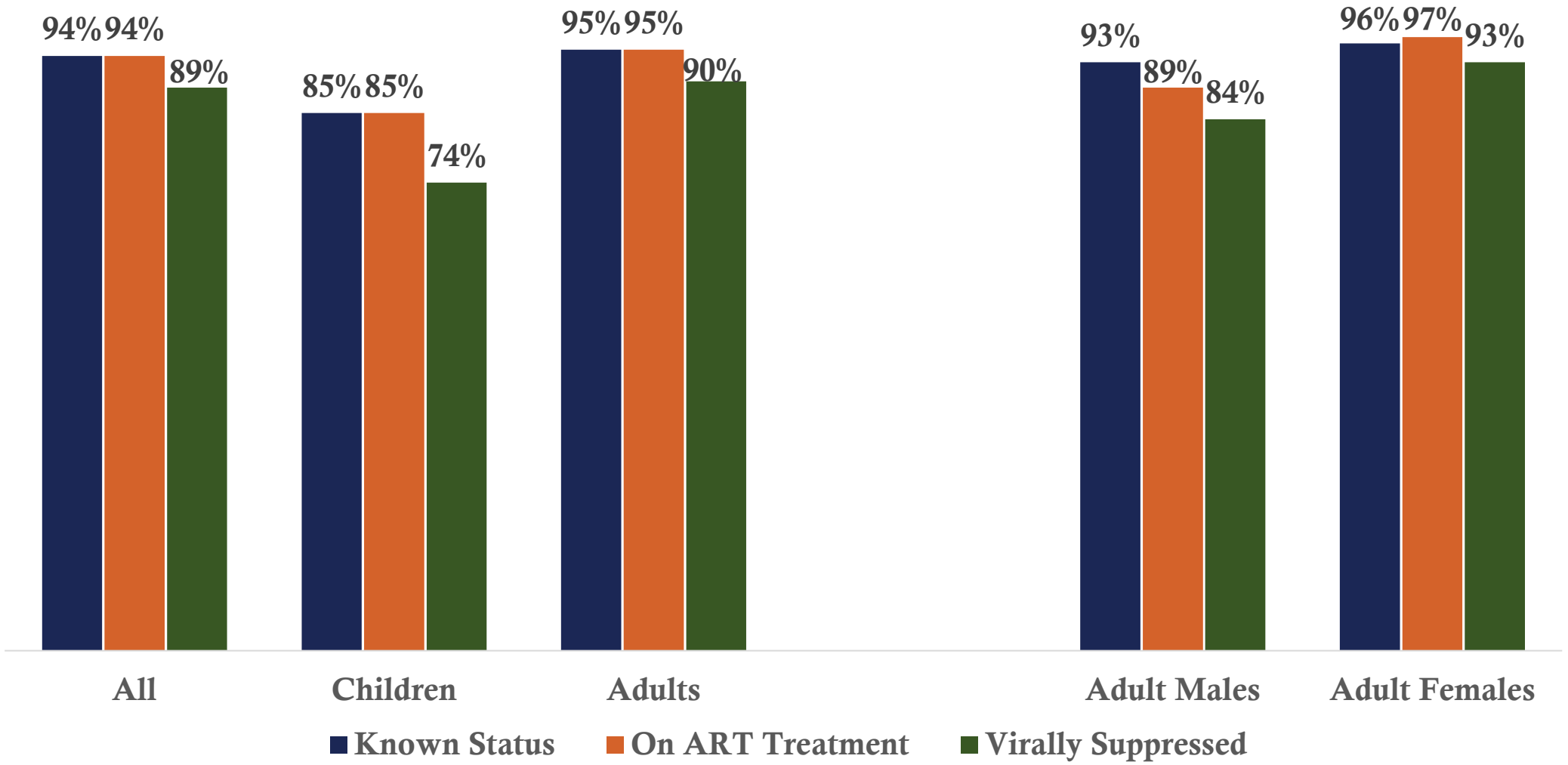
Background: Kenya Epi Profile



- HIV Infections-**22,154**
- HIV Prevalence- **3.7%**
- Incidence- **0.059%**
- Mortality- **18,473**
- MTCT Rate- **8.6%**
- PLHIV- **1,377,784**

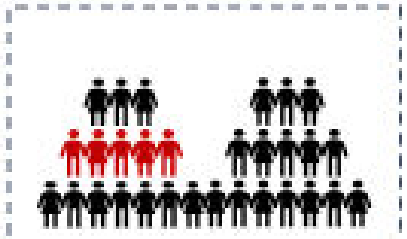
Source: HIV Estimates, 2023

Background: 95-95-95 Progress



Source: *Published UNAIDS Estimates for Kenya, 2022*

To Achieve and Sustain Epidemic Control



~56 million
Population in Kenya

~54.6 million
Non PLHIV persons

~100,000
PLHIV yet to be identified

Targeted HIV prevention, Based on Risk Profile

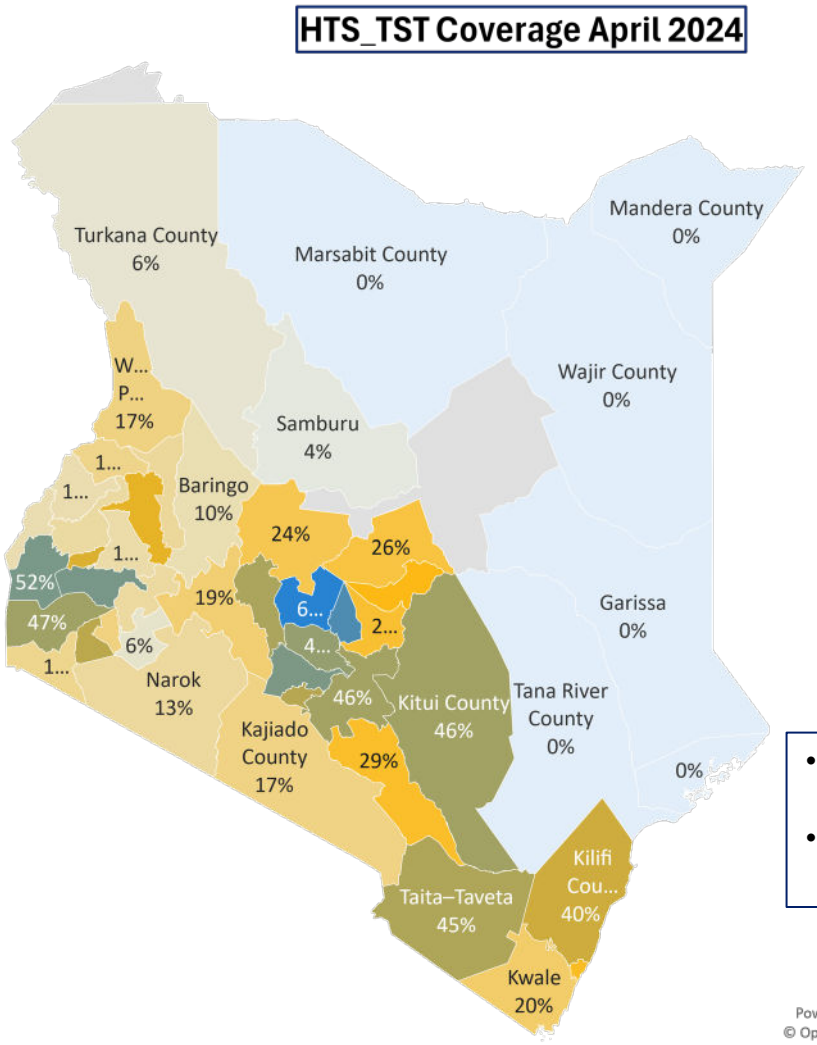
Targeted HIV testing to identify the ~100,000 missing PLHIV

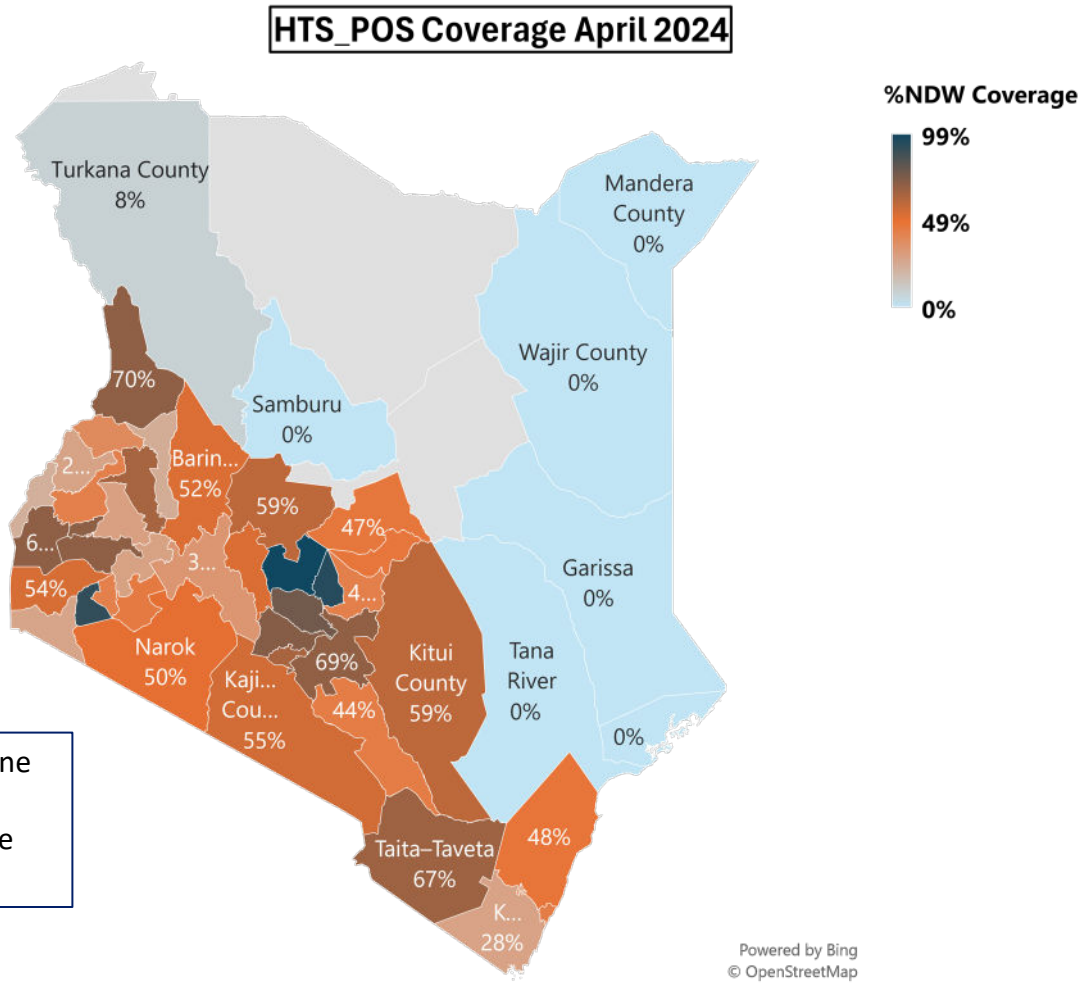
~1.3 million
Persons Living with HIV (PLHIV) on Treatment

- Prevent dropping off treatment
- Prevent viral non-suppression
- Prevent mother to child transmission of HIV
- Prevent NCDs and other comorbidities

Eliminate HIV/AIDS as a public health threat by 2027

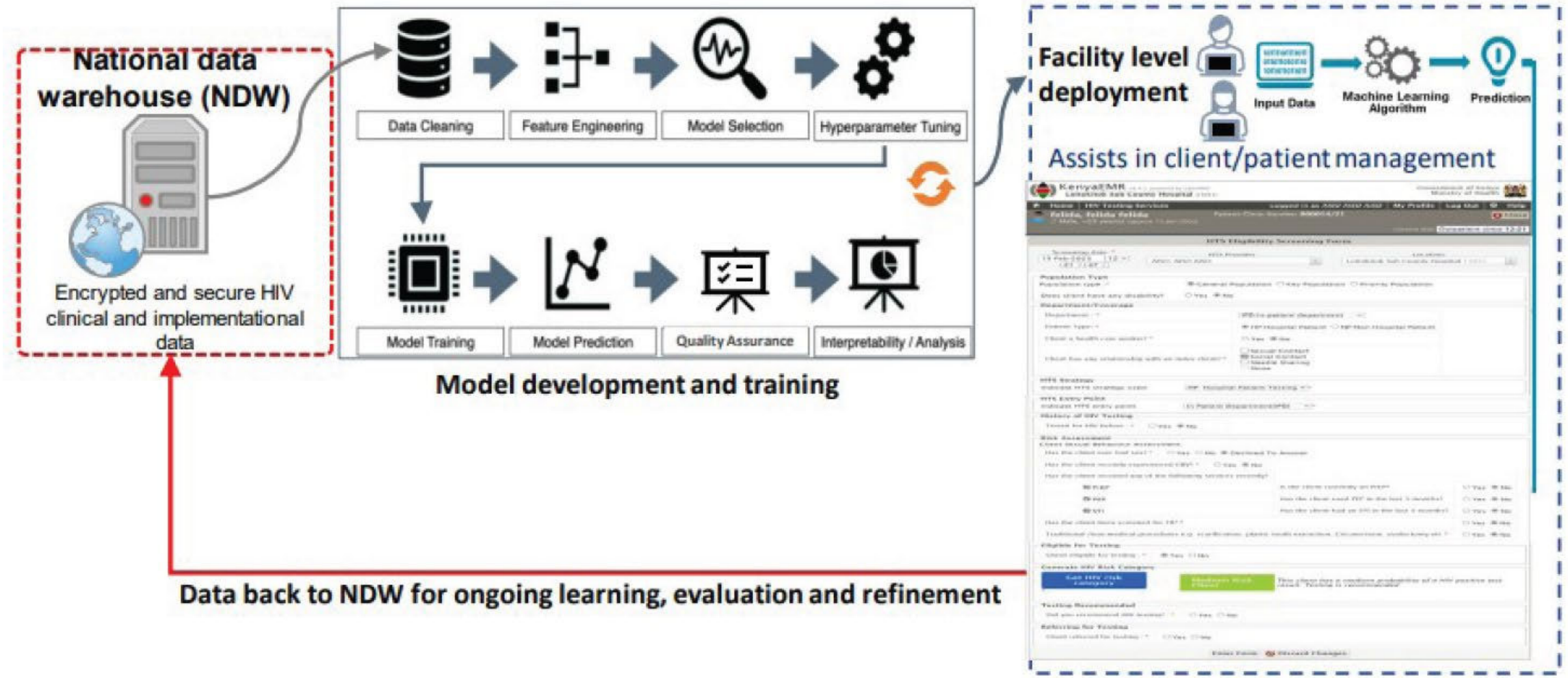
Data will be Key: % of HTS Data Captured Electronically and transmitted to the National Data Warehouse (NDW)





- **32%** (197,138/609,031) of tests done country wide are available in NDW
- **53%** (3,658/6,924) of tested positive countrywide are available in NDW

Building on eHTS Platform: Machine Learning Solutions



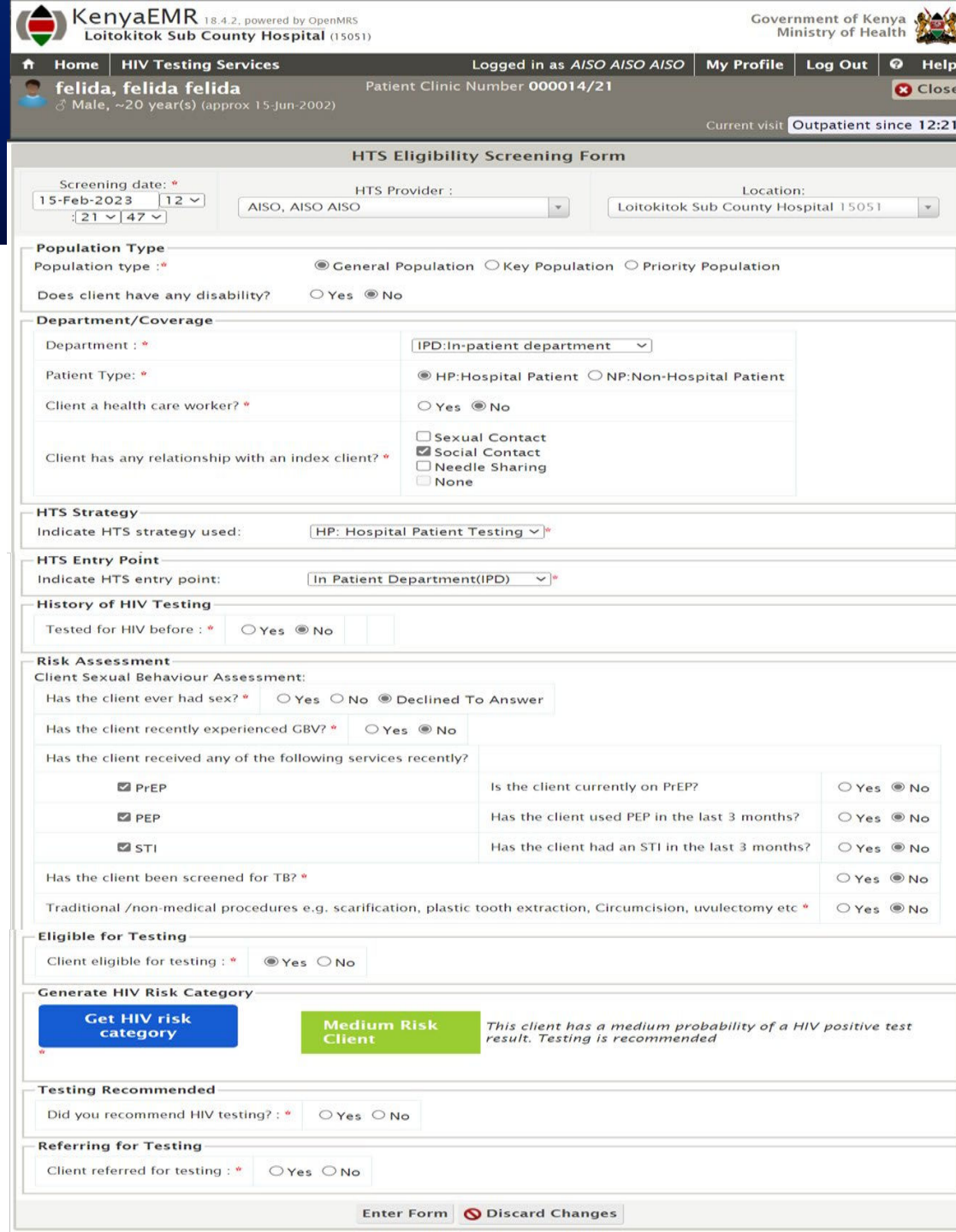
Machine Learning for HTS

What is it?

- A HIV testing decision alert system that relies on a machine learning algorithm to classify risk of testing HIV positive.
- The algorithm uses both Sociodemographic and Behavioral variables.

How does it work?

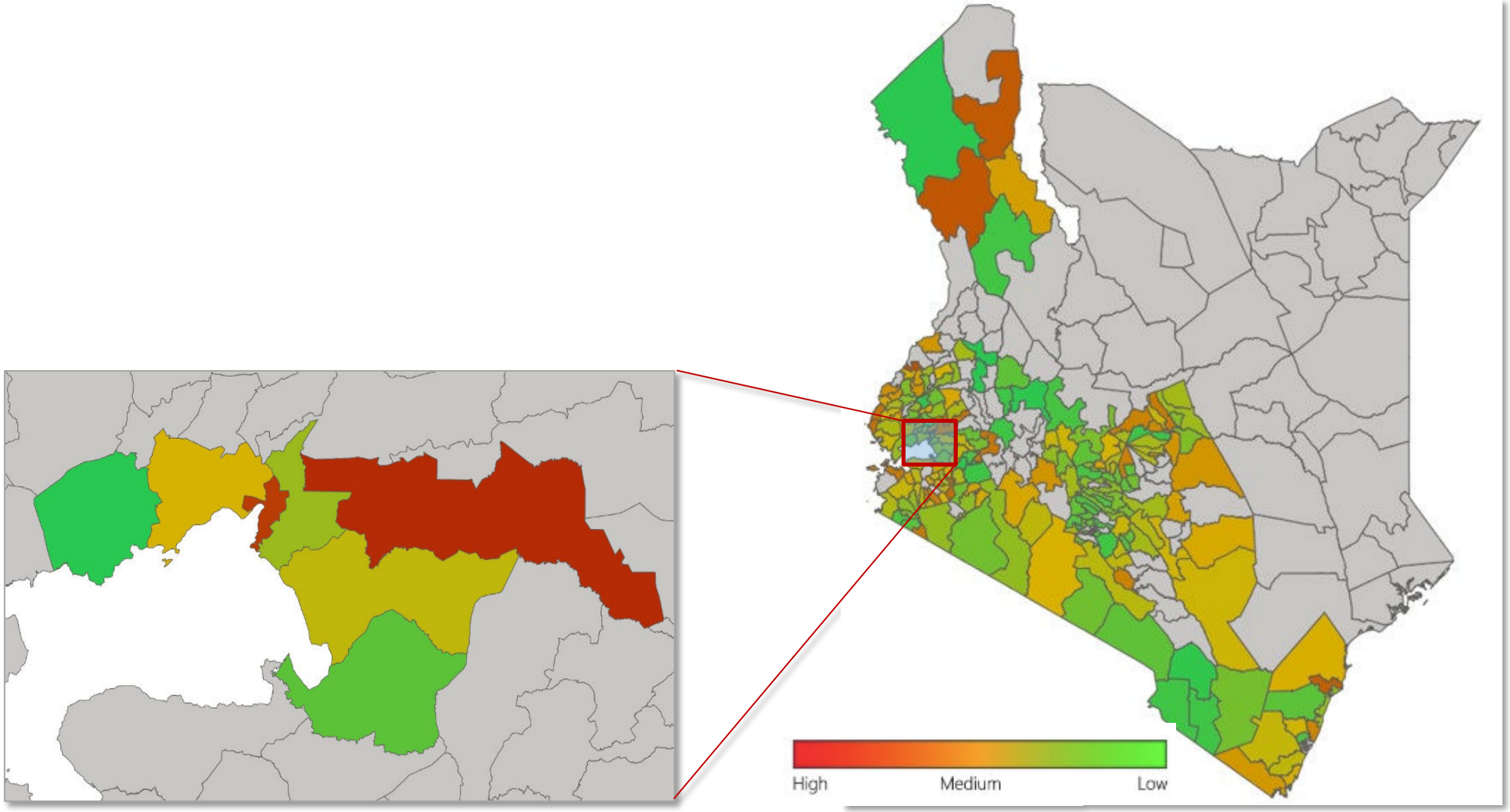
- HTS providers generate the probability of positive results and are notified of HIV testing recommendation based on client's risk.
- Providers can refer clients for HIV prevention for high-risk clients that turn HIV negative.



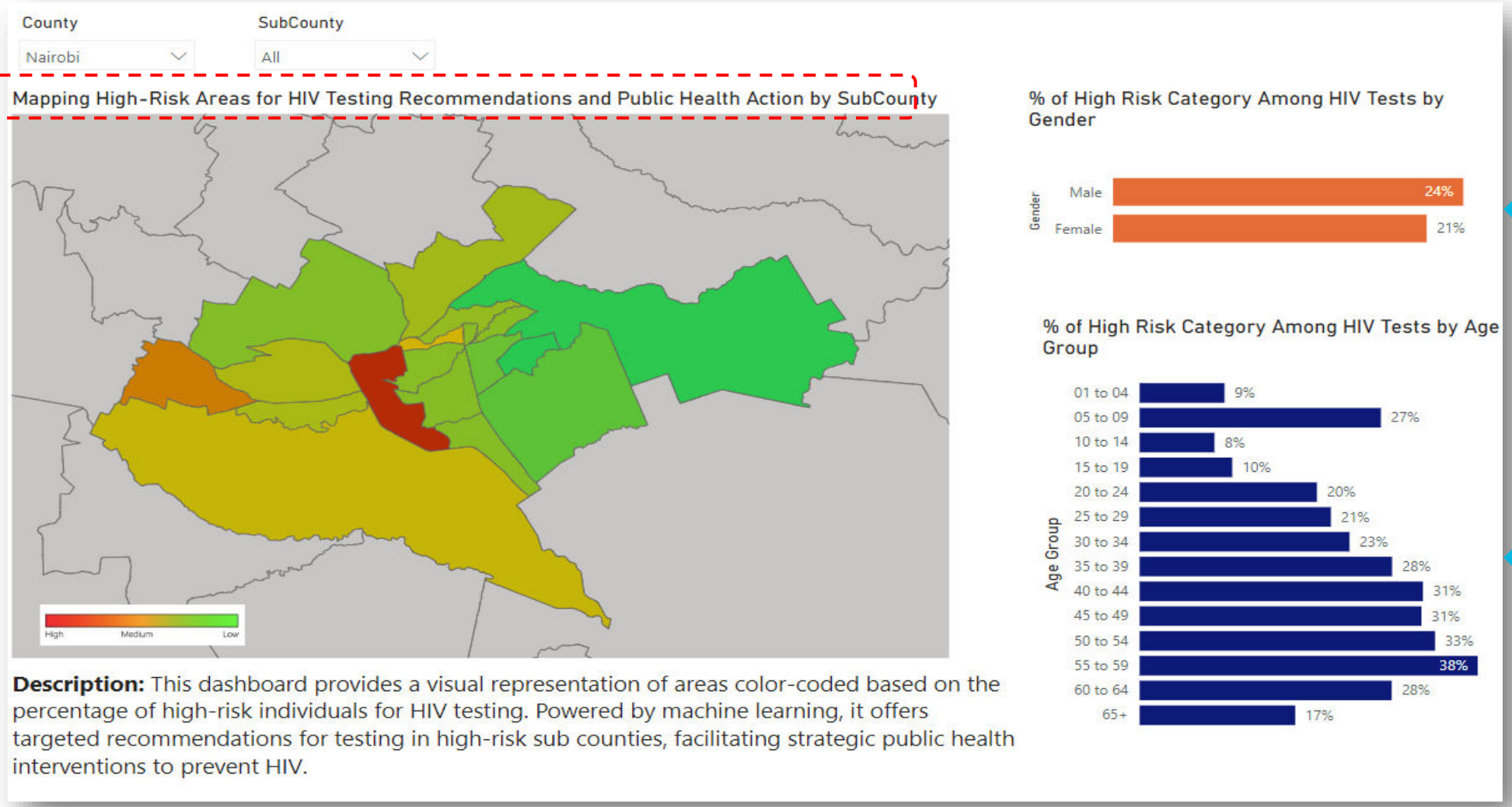
Use Case 1: Use of ML to Track Linkage to Prevention Services by Risk Profile

Referral Service	High or Very High				Low or Moderate			
	Female (N = 131,152)		Male (N = 60,969)		Female (N = 613,433)		Male (N = 292,996)	
Comprehensive care center	2,917	2.22%	1,704	2.79%	3,042	0.50%	1,856	0.63%
Condom use counselling	33,376	25.45%	18,739	30.74%	129,778	21.16%	73,723	25.16%
Confirmatory test	3,260	2.49%	1,877	3.08%	3,549	0.58%	2,083	0.71%
DBS for PCR	10	0.01%	1	0.002%	9	0.001%	7	0.002%
HIV testing and re-testing	13,011	9.92%	6,914	11.34%	77,944	12.71%	29,077	9.92%
Post-exposure prophylaxis	6,233	4.75%	3,606	5.91%	21,794	3.55%	14,292	4.88%
Pre-Exposure Prophylaxis	19,669	15.00%	10,468	17.17%	63,380	10.33%	34,120	11.65%
Prevention and treatment of STIs	8,408	6.41%	4,966	8.15%	44,277	7.22%	19,364	6.61%
Prevention of GBV	6,918	5.27%	3,158	5.18%	41,815	6.82%	13,452	4.59%
Risk reduction counselling	48,932	37.31%	24,437	40.08%	228,561	37.26%	113,476	38.73%
Safer sex practices	38,511	29.36%	19,431	31.87%	180,601	29.44%	87,553	29.88%
Substance abuse and mental health treatment	4,246	3.24%	2,779	4.56%	18,287	2.98%	10,924	3.73%
VMMC	-	-	3,059	5.02%	-	-	14,064	4.80%
Other	4,392	3.35%	1,850	3.03%	22,084	3.60%	7,689	2.62%

Use Case 2: Use of ML for Geographic Clustering of Risk Profiles



Use Case 3: Use of ML for Geographic and Demographic Clustering of Risk Profile



Description: This dashboard provides a visual representation of areas color-coded based on the percentage of high-risk individuals for HIV testing. Powered by machine learning, it offers targeted recommendations for testing in high-risk sub counties, facilitating strategic public health interventions to prevent HIV.

Distribution of Risk by Sex

Distribution of Risk by Age

Summary

- Useful tools to tailor services and interventions
- Investment in data systems is key:
    - Data collection
    - Data transmission
    - Data storage
    - Data Privacy
- Multidisciplinary team engagement
- Program- Strategic direction, end user feedback on the look and feel of systems
- HIS-System architecture, model development, testing, deployment and monitoring

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Thank You!